

Serial No. 10/569,781  
Atty. Doc. No. 2003P11654WOUS

### REMARKS

Claims 20-38 are pending in this application. The specification stands objected-to under 35 USC 112, first paragraph for three specific examples of lack of clarity cited by the Examiner. Claims 20-38 stand rejected under 35 USC 112, first paragraph, as failing to comply with the enablement requirement. Claims 20-38 stand rejected under 35 USC 103(a) as being unpatentable over applicant's admitted prior art as set forth in pages 1-2 of the specification.

#### Objections to the specification:

First, it is noted that the Examiner has made reference to the originally filed specification. However, a Substitute Specification has been presented which is different than the originality filed specification. Accordingly, the Applicant's comments below make reference to the clean version of the Substitute Specification by reference to paragraph number and line number within such paragraphs.

1) The Examiner states that at page 3, lines 4+ is not clear how or in what manner the interactions of the alloying elements and/or additive elements influencing castability are taken into account in the alloy calculation. The Applicant responds that the manner of taking these interactions into account is clearly explained in the remainder of the specification and figures, for example and not intending to be limiting, by paragraph 0009 and by the description of FIGs. 2 and 3 as explained in paragraphs 00040 through 00046. It is explained therein that the prior art method of controlling relative concentrations of elements considered only mechanical properties (paragraph 0009, lines 2-3), whereas the present inventors have recognized that such relative concentrations of elements also affect castability (paragraph 0009, line 3). FIG. 2 illustrates the prior art range of acceptable concentrations for elements x and y as the two sets of straight lines parallel to the axes (paragraph 00041, line 2-3). It is well known that prior art alloy calculations simply adjusted the elemental composition of the melt so that it would fall within the rectangle defined by these lines on FIG. 2. Paragraph 00042 explains that the alloy calculations under the present invention must also ensure that the material properties lie within a castable range existing within region 6 of FIG. 2. Thus a melt at point 7 of FIG. 2 would be acceptable in the prior art because it would predict acceptable mechanical properties, however, under the presently claimed method it would be rejected because it is outside of region 6. These elemental interactions are

Serial No. 10/569,781  
Atty. Doc. No. 2003P11654WOUS

taken into account in the present invention as illustrated in FIG. 3, where a first analysis of a melt reveals that it is at an uncastable point 10, then a treatment of the melt is carried out in an attempt to move the relative concentrations of C and S to within triangle 9, and an acceptable melt chemistry is finally achieved at point 12. Thus, the interactions influencing castability are taken into account by imposing relative elemental concentration limitations that are above and beyond the known prior art relative elemental concentration limitations. The specific steps of how such relative concentrations are determined and how they are manipulated in a heat are well known in the art; it is their impact on castability and their further restriction to achieve good castability that is recognized and that is described in the present specification. Accordingly, withdrawal of this first objection to the specification is respectfully requested.

2) The Examiner also states that at page 5, line 28 the specification refers to mathematical models and that it is not clear how or in what manner the interactions are implemented with the mathematical models. The Applicant responds that the specification clearly describes how the elemental interactions are plotted on and are controlled via the use of graphs such as FIGs. 2-4. The Applicant further responds that mathematical models that represent such graphical displays are well known in the art, and thus this second objection to the specification is without merit. However, it is further noted that claims 28-30 referring to the use of such mathematical models have been cancelled herein, thereby rendering this objection to the specification moot, since the cited portion of the specification is not necessary to support the pending claims.

3) The Examiner also states that at page 9, last line and page 10, line 14 the specification is unclear what equation 1 is referred to. The Applicant responds that the term "equation 1" is clearly referring to the step illustrated in FIG. 1 and labeled with number 1. Here, again, since claims 28-30 have been cancelled, this objection is rendered moot.

**Rejection of claims 20-38 under 35 USC 112 first paragraph:**

Claims 20-38 are cancelled herein, thereby rendering moot the rejections under 35 USC 112.

**Newly added claims:**

The Applicant appreciates the Examiner's concerns with claims 20-38 and has elected to present an entirely new claim set for consideration. The undersigned attorney apologizes if this

Serial No. 10/569,781

Atty. Doc. No. 2003P11654WOUS

approach is viewed by the Examiner as increasing the effort required for examination; however, it is believed by the Applicant that in the long run this approach will require less effort on behalf of both the Examiner and the Application because the newly presented claims are believed to be more clearly focused on the invention.

Rejection of claims under 35 USC 103(a) over applicant's admitted prior art:

Claims 20-38 are cancelled herein, thereby rendering moot the rejections under 35 USC 103. However, the Applicant appreciates the Examiner's comments and provides the following remarks addressing the patentability of the new claims over the admitted prior art.

While it is clear that certain prior art melt processes would sometimes produce castable liquid steel (point 8 of FIG. 2) and would sometimes produce uncastable liquid steel (point 7 of FIG. 2), such differences in castability were not recognized as being a function of the interrelationship of certain melt elements. It is only the present Applicant that has recognized such relationships and has described methods that exploit such knowledge to achieve a more efficient casting process. The newly presented claim set includes limitations that were not inherently practiced by prior art processes that randomly produced castable materials.

For example, independent claim 39 includes the limitations of establishing a first range of relative concentration limits for at least two elements of a melt such that a subsequent casting of the melt will exhibit acceptable mechanical properties; establishing a second range of relative concentration limits for the at least two elements of the melt as a subset of the first range of relative concentration limits such that the melt is castable; and controlling chemistry of the melt to within the second range of relative concentration limits. Prior art processes admittedly include the establishing of a first range as in this claim, but the establishment of a second range as a subset of the first range specifically related to castability, and the control of the chemistry to within the second range are missing from the prior art.

Dependent claims 40-42 add limitations directed to specific elements considered and controlled in the second range. The prior art processes failed to recognize the importance of these particular relationships to the castability of the melt.

Dependent claim 43 includes limitations directed to displaying the ranges on a graph with a point representing the measured relative concentration of the elements in the melt. The prior art does not display such a second range as a sub-area of a first range.

Serial No. 10/569,781  
Atty. Doc. No. 2003P11654WOUS

Finally, dependent claim 44 claims the use of the process in a thin-strip continuous casting machine according to a twin-roller casting process. No such process has been used in the prior art.

Conclusion:

Reconsideration of the application and allowance of claims 39-44 are respectfully requested. The commissioner is hereby authorized to charge any appropriate fee due in connection with this paper, or credit any overpayments to Deposit Account No. 19-2179.

Respectfully submitted,

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